Page 4.12 – Example 12 (a)

₹2,000 is invested at annual rate of interest of 10%. What is the amount after two years if compounding is done Annually?

(a) ₹2,420 (b) ₹2,430 (c) ₹2,440 (d) None

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Compound Interest.

Page 4.12 — Example 12(a)

Sol ⇒ $P = ₹2000$ $R = 10\%$ $T = 2$ years $m = 1$

$A = ?$

$$A = P\left[1 + \frac{R}{100 \times m}\right]^{T \times m}$$

$$A = 2000\left[1 + \frac{10}{100}\right]^{2}$$

$$A = 2000\,(1.1)^2$$

$$A = 2000\,(1.21)$$

$$A = 2420/=$$

m = No. of conversion periods.

Yearly = 1

Half-yearly = 2

Quaterly = 4

monthly = 12

Page 4.12 – Example 12 (b)

₹2,000 is invested at annual rate of interest of 10%. What is the amount after two years if compounding is done Semi-annually?

(a) ₹2,429 (b) ₹2,430 (c) ₹2,431 (d) None

Page 4.12 – Eax 12 (b)

Sol^n ⇒ $P = 2000$ $R = 10\%$ $T = 2$ years

$n = 2$ $A = ?$

$$A = P\left[1 + \frac{R}{100 \times n}\right]^{T \times n}$$

$$A = ₹2000\left[1 + \frac{10}{100 \times 2}\right]^{2 \times 2}$$

$$A = 2000\left[1 + \frac{10}{200}\right]^{4}$$

$$A = 2000\ (1.05)^4$$

$$A = 2431/-$$

Page 4.12 – Example 12 (c)

₹2,000 is invested at annual rate of interest of 10%. What is the amount after two years if compounding is done Quarterly?

(a) ₹2,429.80 (b) ₹2,436.80 (c) ₹2,431.80 (d) None

Page 4.12 – Example 12 (c)

Sol^{n} = $P = 2000$, $R = 10\%$ $T = 2$ years

$m = 4$, $A = ?$

$$A = P\left[1 + \frac{R}{100 \times m}\right]^{T \times m}$$

$$A = 2000\left[1 + \frac{10}{400}\right]^{8}$$

$$A = 2000\left(1.025\right)^{8}$$

$$A = 2436.80 /=$$

Page 4.12 – Example 12 (d)

₹2,000 is invested at annual rate of interest of 10%. What is the amount after two years if compounding is done Monthly?

(a) ₹2,440.58 (b) ₹2,436.80 (c) ₹2,439.80 (d) None

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Page 4.12 – Ex 12 (d)

Sol^{n} → $P = 2000$ $R = 10\%$ $T = 2$ years

$m = 12$ $A = ?$

$$A = P\left[1 + \frac{R}{100 \times m}\right]^{T \times m}$$

$$A = 2000\left[1 + \frac{10}{1200}\right]^{24}$$

$$A = 2000\,(1.0083)^{24}$$

$$A = 2440.78/-$$

Page 4.9 – Example 11

Saina deposited ₹1,00,000 in a nationalized bank for three years. If the rate of interest is 7% p.a., calculate the interest that bank has to pay to Saina after three years if interest is compounded annually. Also calculate the amount at the end of third year.

(a) ₹22,504.30; ₹1,22,504.30

(b) ₹22,436.80; ₹1,22,436.80

(c) ₹22,439.80; ₹1,22,439.80

(d) None

Page 4.9 – Ex: 11

Sol^{n} :→ $P = 1,00,000$ $T = 3$ years $R = 7\%$

$n = 1$ $C.I = ?$ $A = ?$

$$C.I = A - P \qquad A = P\left[1 + \frac{R}{100 \times n}\right]^{T}$$

Or

$$C.I = P\left[\left(1 + \frac{R}{100 \times n}\right)^{T \times n} - 1\right]$$

$$C.I = 1,00,000\left[\left(1 + \frac{7}{100 \times 1}\right)^{3} - 1\right]$$

$$C.I = 22504.3$$

And,

$$A = P\left(1 + \frac{R}{100 \times n}\right)^{T \times n}$$

$$A = 1,00,000\left(1 + \frac{7}{100}\right)^{3}$$

$$A = 122504.3$$

Page 4.12 – Example 13

Determine the compound amount and compound interest on ₹1,000 at 6% compounded semi-annually for 6 years.

(a) ₹1,425.76; ₹425.76	(b) ₹425.76; ₹1,425.76	(c) ₹22,439.80; ₹1,22,439.80	(d) None

Page 4.12 – Ex 13.

$P = ₹1000 \quad R = 6\% \quad m = 2 \quad T = 6 \text{ years}$

$A = ? \quad C.I = ?$

$$A = P\left[1 + \frac{R}{100 \times m}\right]^{T \times m}$$

$$A = 1000\left[1 + \frac{6}{200}\right]^{12}$$

$$A = 1000\,(1.03)^{12}$$

$$A = 1425.76$$

Now,

$$C.I = A - P$$

$$C.I = 1425.76 - 1000$$

$$C.I = 425.76/=$$

Exercise 4B – Question 1

If P = 1,000; R = 5% p.a., and n = 4, what is the amount and C.I.?

(a) ₹1,215.50, ₹215.50 (b) ₹1,125, ₹125 (c) ₹2,115, ₹115 (d) None

Ex 4B – Q1

$P = 1000$, $R = 5\%$, $n = 4$ (Txn), $A = ?$, $C.I = ?$

$$A = P\left[1 + \frac{R}{100}\right]^n$$

$$A = 1000\left[1 + \frac{5}{100}\right]^4$$

$$A = 1000\,(1.05)^4$$

$$A = 1215.50$$

$$C.I = A - P$$

$$C.I = 1215.50 - 1000$$

$$C.I = 215.50/-$$

Page 4.13 – Example 14

Compute the compound interest on ₹4,000 for 1½ years at 10% p.a. compounded half- yearly.

(a) ₹430.50 (b) ₹530.50 (c) ₹630.50 (d) None

Page 4.13 - Ex 14

$P = ₹4000 \quad T = 1\frac{1}{2} = 1.5 \text{ years} \quad R = 10\%$

$m = 2 \quad C.I = ?$

$$C.I = P\left[\left(1 + \frac{R}{100 \times m}\right)^{T \times m} - 1\right]$$

$$C.I = 4000\left[\left(1 + \frac{10}{200}\right)^{3} - 1\right]$$

$$C.I = 4000\left[(1.05)^{3} - 1\right]$$

$$C.I = 630.5$$

Exercise 4B – Question 2

₹100 will become after 20 years at 5% p.a. compound interest of:

(a) ₹250 (b) ₹205 (c) ₹165.33 (d) None

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Ex 4B - Question 2

$P = 100$ $T = 20$ years $R = 5\%$ $C.I = ?$

$m = 1$

$$C.I = P\left[\left(1 + \frac{R}{100 \times m}\right)^{T \times m} - 1\right]$$

$$C.I = 100\left[\left(1 + \frac{5}{100}\right)^{20} - 1\right]$$

$$C.I = 100\left[(1.05)^{20} - 1\right]$$

$$C.I = 165.32/-$$

Exercise 4B – Question 10

The C.I. on ₹16,000 for 1½ years at 10% p.a. payable half-yearly is:

(a) ₹2,222 (b) ₹2,522 (c) ₹2,500 (d) None

Ex 4B – Question 10

$P = 16000 \quad T = 1\frac{1}{2} \text{ years} = 1.5 \quad R = 10\%$

$m = 2 \quad C.I = ?$

$$C.I = P\left[\left(1 + \frac{R}{100 \times m}\right)^{T \times m} - 1\right]$$

$$C.I = 16000\left[\left(1 + \frac{10}{200}\right)^{3} - 1\right]$$

$$C.I = 2592/=$$

Exercise 4C – Question 9

Mr. X borrowed ₹5,120 at 12½% p.a. C.I. At the end of 3 years, the money was repaid along with the interest accrued. The amount of interest paid by him is:

(a) ₹2,100 (b) ₹2,170 (c) ₹2,000 (d) None

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Ex 4C – Q9

$P = ₹5120$ $R = 12\frac{1}{2}\% = 12.5\%$ $T = 3$ years

$C.I = ?$

$$C.I = P\left[\left(1 + \frac{R}{100}\right)^T - 1\right]$$

$$C.I = \{5120\left[\left(1 + \frac{12.5}{100}\right)^3 - 1\right]$$

$$C.I = 5120\left[(1.125)^3 - 1\right]$$

$C.I = 2170/=$

Exercise 4D – Question 2

If P = 1,000, n = 4 years, R = 5% p.a. then C.I. will be:

(a) ₹215.50 (b) ₹210 (c) ₹220 (d) None

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Ex 4D - Question 2

$P = 1000$, $T = 4$ years, $R = 5\%$, $C.I = ?$

$$C.I = P\left[\left(1 + \frac{R}{100}\right)^T - 1\right]$$

$$C.I = 1000\left[\left(1 + \frac{5}{100}\right)^4 - 1\right]$$

$$C.I = 1000\left[(1.05)^4 - 1\right]$$

$$C.I = 215.50$$

Additional Question Bank – Question 2

The compound interest on half-yearly rests on ₹10,000 the rate for the first and second years being 6% and for the third year 9% p.a. is:

(a) ₹2,200 (b) ₹2,287 (c) ₹2,285 (d) None

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AQB – Q1 → for 2 years, 3rd year.

$P = 10,000$, $R_1 = 6\%$, $R_2 = 9\%$

$C.I = ?$ $m = 2$

$$C.I = P\left[\left(1 + \frac{R_1}{100 \times m}\right)^{T \times m}\left(1 + \frac{R_2}{100 \times m}\right)^{T \times m} - 1\right]$$

$$C.I = 10,000\left[\left(1 + \frac{6}{200}\right)^{4}\left(1 + \frac{9}{200}\right)^{2} - 1\right]$$

$$C.I = 10,000\left[(1.03)^4 (1.045)^2 - 1\right]$$

$$C.I = 2290.83 =$$

Exercise 4D – Question 1

H3

A = ₹5,200, R = 5% p.a., T = 6 years, P will be

(a) ₹2,000 (b) ₹3,880 (c) ₹3,000 (d) None

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Ex 4D - Q1

$A = ₹5,200$, $R = 5\%$ $T = 6$ years $P = ?$

$$P = \frac{A}{\left[1 + \frac{R}{100 \times m}\right]^{T \times m}}$$

$$P = \frac{5,200}{\left[1 + \frac{5}{100}\right]^{6}}$$

$$P = \frac{5,200}{(1.05)^{6}}$$

$$P = 3880.32/=$$

Exercise 4D – Question 4

If A = ₹10,000, n = 18yrs., R = 4% p.a. C.I., P will be:

(a) ₹4,000 (b) ₹4,900 (c) ₹4,500 (d) ₹4,936.30

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Ex 4D - Q4

$A = 10,000 \quad T = 18 \text{ years} \quad R = 4\% \quad P = ?$

$$P = \frac{A}{\left[1 + \frac{R}{100}\right]^T}$$

$$P = \frac{10,000}{\left[1 + \frac{4}{100}\right]^{18}}$$

$$P = \frac{10,000}{(1.04)^{18}}$$

$$P = 4936.28/-$$

Exercise 4B – Question 5

If A = ₹1,000; n = 2 years; R = 6% p.a. compound interest payable half-yearly, then Principal (P) is:

(a) ₹888.50 (b) ₹885 (c) ₹800 (d) None

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Ex 4B – Q5

$A = ₹1,000$ $T = 2$ years $R = 6\%$

$n = 2$ $P = ?$

$$P = \frac{A}{\left[1 + \frac{R}{100 \times n}\right]^n}$$

$$P = \frac{1000}{\left[1 + \frac{6}{200}\right]^4}$$

$$P = \frac{1000}{(1.03)^4}$$

$$P = 885.48/-$$

Page 4.15 – Example 19

A certain sum invested at 4% p.a. compounded semi-annually amounts to ₹78,030 at the end of one year. Find the sum.

(a) ₹54,000 (b) ₹75,000 (c) ₹80,000 (d) None

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Page 4.15 - Ex 19

$P = ?$ $\quad R = 4\%$ $\quad A = 78,030$

$m = 2$ $\quad T = 1$

$$P = \frac{A}{\left[1 + \frac{R}{100 \times m}\right]^{T \times m}}$$

$$P = \frac{78,030}{\left[1 + \frac{4}{200}\right]^{2}}$$

$$P = \frac{78,030}{(1.02)^{2}}$$

$$P = 75000/-$$

Page 4.13 – Example 15

On what sum will the compound interest at 5% p.a. for two years compounded annually be ₹1,640?

(a) ₹2,200 (b) ₹1,487.53 (c) ₹16,000 (d) None

Page 4.13 – Example 15 Imp

C.I = 1640 P = ? T = 2 years

R = 5%

$$P = \frac{C.I}{\left[\left(1+\frac{R}{100}\right)^{T}-1\right]}$$

$$P = \frac{1640}{\left[\left(1+\frac{5}{100}\right)^{2}-1\right]}$$

P = ₹ 16000/-

Page 4.14 – Example 18

Find the rate percent p.a. if ₹2,00,000 amounts to ₹2,31,525 in 1½ years, interest being compounded half-yearly.

(a) 11% (b) 10% (c) 12% (d) None

Page 4.14 — Example 18

$P = 200000$ $A = 231525$ $T = 1.5$ years

$m = 2$ $R = ?$

$$A = P\left[1 + \frac{R}{100 \times m}\right]^{T \times m}$$

$$231525 = 200000\left[1 + \frac{R}{200}\right]^{3}$$

$$\frac{231525}{200000} = \left[1 + \frac{R}{200}\right]^{3}$$

$$\frac{9261}{8000} = \left[1 + \frac{R}{200}\right]^{3}$$

$$\sqrt[3]{\frac{9261}{8000}} = \left[1 + \frac{R}{200}\right]$$

$$\frac{21}{20} - 1 = \frac{R}{200}$$

$$\frac{1}{20} = \frac{R}{200}$$

$$200 = 20R$$

$$\frac{200}{20} = R$$

$$R = 10\%$$

How to find cube root on calculator.

$\sqrt{}$ 2 times $\times$ $\sqrt{}$ 4 times $\times$ $\sqrt{}$ 8 times $\times$ $\sqrt{}$ 2 times.

Ex: $9261 \rightarrow \sqrt[2]{\sqrt{}} \times \sqrt[4]{\sqrt{}\sqrt{}} \times \sqrt[8]{\sqrt{}\sqrt{}\sqrt{}} \times \sqrt{\sqrt{}} = 20.9 = 21$

Page 4.14 – Example 16

What annual rate of interest compounded annually doubles an investment in 7 years? Given that $2^{\frac{1}{7}} = 1.104090$

(a) 11.41% (b) 10% (c) 10.41% (d) None

Page 4.14 – Example 16

$P = 100 \quad A = 200 \quad T = 7 \text{ years} \quad R = ?$

$$A = P\left[1 + \frac{R}{100}\right]^T$$

$$200 = 100\left[1 + \frac{R}{100}\right]^7$$

$$\frac{200}{100} = \left[1 + \frac{R}{100}\right]^7$$

$$2^{1/7} = \left[1 + \frac{R}{100}\right]$$

$$1.104090 - 1 = \frac{R}{100}$$

$$0.104090 \times 100 = R$$

$$R = 10.40\%$$

How to do fractional exponent on simple calculator?

Ex: $2^{1.2}$

2 → 1. press $\sqrt{}$ 12 times

→ 2. subtract 1

→ 3. multiply power (1.2)

→ 4. Add 1

→ 5. multiply 12 times.

Ans: 2.2973/....

Page 4.14 – Example 17

In what time will ₹8,000 amount to ₹8,820 at 10% per annum interest compounded half-yearly?

(a) 2 (b) 1 (c) 3 (d) None

Page 4.14 – Ex 17

$P = 8000 \quad A = 8820 \quad R = 10\% \quad m = 2$

$T = ?$

$$A = P\left[1 + \frac{R}{100 \times m}\right]^{T \times m}$$

$$8820 = 8000\left[1 + \frac{10}{200}\right]^{T \times 2}$$

$$\frac{8820}{8000} = (1.05)^{2T}$$

$$1.1025 = (1.05)^{2T}$$

$$1.1025 = (1.05)^{2 \times 1}$$

$T = 1$ year

Page 4.15 – Example 20

₹16,000 invested at 10% p.a. compounded semi-annually amounts to ₹18,522. Find the time period of investment.

(a) 2 years (b) $3\frac{1}{2}$ years (c) $1\frac{1}{2}$ years (d) None

Page 4.15 — Ex 20

$P = 16,000 \quad R = 10\% \quad T = ?$

$A = 18,522 \quad m = 2$

$$A = P\left[1 + \frac{R}{100 \times m}\right]^{T \times m}$$

$$18,522 = 16000\left[1 + \frac{10}{200}\right]^{2T}$$

$$\frac{18,522}{16000} = \left[1.05\right]^{2T}$$

$$1.157625 = (1.05)^{2T}$$

$$1.157625 = (1.05)^{2 \times 1.5}$$

$T = 1.5$ years

Exercise 4B – Question 6

The population of a town increases every year by 2% of the population at the beginning of that year. The number of years by which the total increase of population be 40% is:

(a) 7 years (b) 10 years (c) 17 years (d) None

Ex 4B – Q6

Sol ⇒ $P = 100$ $A = 140$ $T = ?$

$R = 2\%$

$$A = P\left[1 + \frac{R}{100}\right]^T$$

$$140 = 100\left[1 + \frac{2}{100}\right]^T$$

$$\frac{140}{100} = \left[1.02\right]^T$$

$$1.4 = (1.02)^T$$

$$1.4 = (1.02)^{17}$$

$$T = 17 \text{ years}$$

Press Esc to exit full screen

Exercise 4B – Question 13

The annual birth and death rates per 1,000 are 39.4 and 19.4 respectively. The number of years in which the population will be doubled assuming there is no immigration or emigration is:

(a) 35 years (b) 30 years (c) 25 years (d) None

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Q:→ Ex : 4B — Q13.

Birth rate in (%) → $\frac{39.4}{1000} \times 100 = 3.94\%$

Death rate in (%) → $\frac{19.4}{1000} \times 100 = 1.94\%$

$\therefore 2.00\%$

$P = 100$, $A = 200$, $T = ?$ $R = 2\%$

$$A = P\left[1 + \frac{R}{100}\right]^T$$

$$200 = 100\left[1 + \frac{2}{100}\right]^T$$

$$\frac{200}{100} = (1.02)^T$$

$$2 = (1.02)^T$$

$$2 = (1.02)^{35}$$

$T = 35$ years

Exercise 4D – Question 3

The time in which a sum of money will be double at 5% p.a. C.I. is:

(a) 10 years (b) 12 years (c) 14.2 years (d) None

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Ex 4D – Q3

$P = 100$, $A = 200$, $R = 5\%$, $T = ?$

$$A = P\left[1 + \frac{R}{100}\right]^T$$

$$200 = 100 \cdot \left[1 + \frac{5}{100}\right]^T$$

$$\frac{200}{100} = (1.05)^T$$

$$2 = (1.05)^T$$

$$2 = (1.05)^{14}$$

$T = 14$ years

Exercise 4D – Question 5

The time by which a sum of money would treble itself at 8% p.a. C.I. is:

(a) 14.28 years (b) 14 years (c) 12 years (d) None

Ex 4D – Q5

$P = 1$, $A = 3$ $R = 8\%$ $T = ?$

$$A = P\left[1 + \frac{R}{100}\right]^T$$

$$3 = 1\left[1 + \frac{8}{100}\right]^T$$

$$\frac{3}{1} = (1.08)^T$$

$$3 = (1.08)^T$$

$$3 = (1.08)^{14.28}$$

$T = 14.28$ years

Additional Question Bank – Question 6

In how many years will a sum of money double at 5% p.a. compound interest?

(a) 15 years 3 months

(b) 14 years 2 months

(c) 14 years 3 months

(d) 15 years 2 months

Q: A Q B — Question 6

Sol→ $A = 2 \quad P = 1 \quad R = 5\% \quad T = ?$

$$A = P\left[1 + \frac{R}{100}\right]^T$$

$$2 = 1\left[1 + \frac{5}{100}\right]^T$$

$$2 = (1.05)^T$$

$$2 = (1.05)^{14.16}$$

$T = 14$ years & 2 months.

Additional Question Bank – Question 7

HW

In how many years a sum of money trebles at 5% p.a. compound interest payable on half-yearly basis?

(a) 18 years 7 months

(b) 18 years 6 months

(c) 18 years 8 months

(d) 22 years 3 months

AQB - Q7

$P = 100 \quad A = 300 \quad R = 5\% \quad m = 2$

$$A = P\left[1 + \frac{R}{100 \times m}\right]^{T \times m}$$

$$300 = 100\left[1 + \frac{5}{200}\right]^{2T}$$

$$\frac{300}{100} = (1.025)^{2T}$$

$$3 = (1.025)^{2T}$$

$$3 = (1.025)^{2 \times 22}$$

$$T = 22$$

Page 4.16 – Example 21 (a)

A person opened an account on April, 2001 with a deposit of ₹800. The account paid 6% interest compounded quarterly. On October 1, 2001, he closed the account and added enough additional money to invest in a 6-month time-deposit for ₹1,000, earning 6% compounded monthly. How much additional amount did the person invest on October 1?

(a) ₹177.82 (b) ₹176.82 (c) ₹175.82 (d) None

Page 4.16 – Example 21 (a)

$P = 800$ $\quad T = 6 \text{ months} = \frac{6}{12}$ $\quad R = 6\%$ $\quad m = 4$

$$A = P\left[1 + \frac{R}{100 \times m}\right]^{T \times m}$$

$$A = 800\left[1 + \frac{6}{400}\right]^{\frac{6}{12} \times 4}$$

$$A = 800\,(1.015)^2$$

$$A = 824.18/-$$ $\quad I = 24.18$

Additional money $= 100 - 824.18$

$= 175.82$

Page 4.16 – Example 21 (b)

A person opened an account on April, 2001 with a deposit of ₹800. The account paid 6% interest compounded quarterly. On October 1, 2001, he closed the account and added enough additional money to invest in a 6-month time-deposit for ₹1,000, earning 6% compounded monthly. What was the maturity value of his time deposit on April 1, 2002?

(a) ₹1,030.38 (b) ₹1,034.48 (c) ₹1,059.68 (d) None

Page 4.16 – Ex 21 (b)

$P = 1000, \quad T = \frac{6}{12} \quad R = 6\% \quad m = 12$

$$A = P\left[1 + \frac{R}{100 \times m}\right]^{T \times m}$$

$$A = 1000\left[1 + \frac{6}{1200}\right]^{\frac{6}{12} \times 12}$$

$$A = 1000\,(1.005)^6$$

$$A = 1030.37$$

$$I = 30.35$$

Page 4.16 – Example 21 (c)

A person opened an account on April, 2001 with a deposit of ₹800. The account paid 6% interest compounded quarterly. On October 1, 2001, he closed the account and added enough additional money to invest in a 6-month time-deposit for ₹1,000, earning 6% compounded monthly. How much total interest was earned?

(a) ₹230.38 (b) ₹54.56 (c) ₹175.39 (d) None

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Page 4.16 — Ex 21 (c)

$$24.18 + 30.38$$

$$= 54.56$$